Chapter 3

Employment protection and product market competition

3.1 Introduction

Employment protection (EP) regulations are frequently blamed for hurting firms' competitiveness. They expose firms to a hold-up problem. The workers a firm hires when demand for its products is high will be protected later on when demand is low. This problem has been extensively analyzed in the literature on dynamic labor demand as discussed in chapter one. However, EP also has important implications for product market competition. If a firm already has hired workers, who are protected by EP regulations, it will fiercely defend its market position. In cost terms, the decision to expand increases future fixed costs and reduces variable costs. Expanding own production by employing new workers threatens the firm with potential costs if these workers become redundant later. Thus, the firm will be more cautious about expanding its market position ex ante. This influences firms' behavior, if they interact strategically in imperfectly competitive markets. The aim of this chapter is to study the nature of this relationship and to derive the effects on the product market.

Two aspects are essential for analyzing the effects of EP on product market competition. First, for the assessment of the average effect of EP on a firm's market position a dynamic setting must be explicitly considered in order to trade off the ex ante and ex post effects. Second, while the mechanism analyzed here is present in many settings, its importance will typically depend on the kind and intensity of product market competition and the opportunities this offers for firms to expand and defend their market position. For simplicity, I focus on the case in which firms compete with each other in contests. This case is a natural benchmark, since price and quantity decisions can be neglected, but firms can affect demand through their contest behavior.

To illustrate what is meant by contest competition, consider the procurement of some large project or a large scale sales contract. In many of these instances the allocation is not, or is only partly, determined through the price mechanism. Instead, in such markets potential contractors typically make substantial efforts to make their offer attractive. Konrad (2000) lists three main fields where such efforts may be made. First, specific R&D measures may be carried out to tailor the product for a specific customer. Second, firms invest in specific commitments, that the buyers want, such as reliable maintenance services. Third, firms try to influence decision makers directly through marketing activities, generous behaviour, or bribes. What all these activities have in common is that the costs incurred by the firms are essentially sunk. Thus, the competition between the firms can be well described by an all-pay auction, a contest.[1] As a by-product, this specification

[1]For a general discussion of contests and motivation see Dixit (1987) and Skaperdas

also allows the results of the analysis to be applied directly to another important aspect of competition between firms, namely competition in R&D. In such an interpretation the contests can be considered as steps in a sequential R&D race, where each success implies a major innovation that guaranties monopoly profits for one period.

I consider a situation in which two firms repeatedly engage in contests for contracts. In order to work out the differential effects of EP, one firm is based in country with a "rigid" labour market and therefore faces EP regulations, whereas the other firm operates in a "flexible" country and is therefore in a position to hire and fire without restriction. The outcome of the contests between the firms is affected by the EP regulations, since they reduce the rigid country's firm's flexibility by increasing its fixed costs. For such a firm, which has already hired workers, losing a contest implies additional costs to this firm due to the existing EP provisions. This increases the relative benefits from winning and consequently affects contest outcome. However, ex ante, if it has not already hired workers, it will foresee the consequences of winning a contract: workers hired to carry out the contract just won will be protected later on. Therefore contests in which neither firm has not already hired workers will also be affected. The impact of EP on the average contest outcome is thus assessed by considering a dynamic setting which allows the interaction between both situations to be captured.

The key result is that employment protection tends to increase the long run average probability of winning for the firm from the "rigid" country and that it therefore has a stronger average market position. It has a higher probability of winning if its own workers are protected. If workers have not yet been hired, the firms winning probabilities are equal. However, expected

and Syropoulos (2002).

equilibrium profits are equal for both firms. Finally, welfare will typically be higher in the rigid country if wage or severance payments include a rent component which accrues to the workers. The results have to be modified, if the firm from the rigid country is less efficient, the contest success functions are more noisy, or if employment protection not only reduces firms' flexibility, but also certainly imposes cost increases on the firm. Such changes weaken the mechanism responsible for the increase in the average winning probability.

The analysis is related to a number of recent contributions that have analyzed various implications of EP regulations other than the consequences for labor demand. Glazer and Kanniainen (2002) consider the effects of EP on a firm's choice of risky projects. They find that a firm that faces EP regulations prefers risk free projects to risky ones, but if confronted with the choice between two risky projects, it may prefer the riskier one. Two contributions by Saint-Paul (1997, 2002b) study the effects of EP on international specialization and differences in innovative behavior. Countries with a high level of EP will specialize on mature products and their inventions tend to be focussed on these industries, whereas countries with low EP produce goods at the beginning of the product cycle and tend to innovate in these areas. Fella (2000) has used a search model to analyze how EP can increase workers productivity by increasing the firms willingness to invest in general training. In a similar framework, Belot et al. (2002) show how workers' effort can be positively affected by EP provisions. Finally, Koeniger (2002), using a model of step-by-step innovations, shows that EP will lead to faster growth, if product market competition is sufficiently low.

On a more technical level the present study relates to the theoretical discussion of contests by considering sequentially dependent prizes in repeated contests. To my knowledge, only Konrad (2001) considers repeated contests.

However, in his setting, the contest outcome determines whether another contest is played or not, but it does not affect the players' valuations over time. However, in my setting, a contest's outcome affects next period contest valuations, giving rise to interesting interaction. Such dynamic interaction between contest prizes may well be used to study other phenomena.

The chapter is organized as follows. Section two presents a two period model to illustrate the workings of the fundamental mechanism in a finite horizon setting. In section three the model is extended to an infinite horizon. Section four considers the robustness of the results to changes in the assumptions. Section five concludes.

3.2 The two period model

Consider two risk neutral firms, A and B, that operate from different countries. While in firm B's home country the labor market is rather unregulated, firm A's home country has labor market rigidities in the form of EPL. The firms are competing in two periods for contracts in contests. In the first period they compete for the first contract, in the second period for the second contract. In each contest the winning party is determined according to the following contest success function which relates the two firms' efforts e^A and e^B to their probabilities of winning the contract π^A and π^B:

$$\pi^A(e^A, e^B) = \left\{ \begin{array}{c} 1 \\ 1/2 \\ 0 \end{array} \right\} \text{ if } \left\{ \begin{array}{c} e^A > e^B \\ e^A = e^B \\ e^A < e^B \end{array} \right\}, \tag{3.1}$$

$\pi^B(e^A, e^B) = 1 - \pi^A(e^A, e^B)$. The contest success function (3.1) is called fully discriminatory, since the party putting in slightly more effort than its counterpart wins the contest for sure. It is particularly relevant since the party staging the contest maximizes effort by choosing such a scheme. In section four the robustness of the results to changes in the contest success functions are discussed.[2]

Each contract implies a rent of size S for the winning firm. This rent is net of the costs incurred by carrying out the contract, including the wages for the workers hired in that period. At the outset in the first period, neither firm has hired workers. The firm winning the contest will hire workers according to the labor market regulations it faces in its home country to carry out the contract. Firm B may only hire them for one period, since it operates in an unregulated labor market. However, since firm A faces employment protection regulations, it has to hire them for two periods. Thus, if firm A does not win the contest in period two after winning it in period one, it will still have to pay wages of size γS, $\gamma > 0$, to its workers. Alternatively, these payments may be regarded as severance payments. If it wins the contract, the workers employed are used to carry out the contract and, after paying its workers and covering other costs, it again earns a net rent of S. This is a stylized way to capture typical employment protection legislation. It reduces the firm's flexibility, but, if the firm manages to win another contract, it does not increase the firm's cost. Section four discusses the resulting changes to the model if employment protection regulations cause costs to the firm, which can not be avoided by winning additional contracts. Finally, note that the assumption of fixed wage costs for both firms which also remain unaffected by the existence of employment protection is for simplicity but can be justified by assuming a Leontief technology that has to be applied for carrying out the contract.

[2] For a general discussion and axiomatization of contest success functions see Skaperdas (1996).

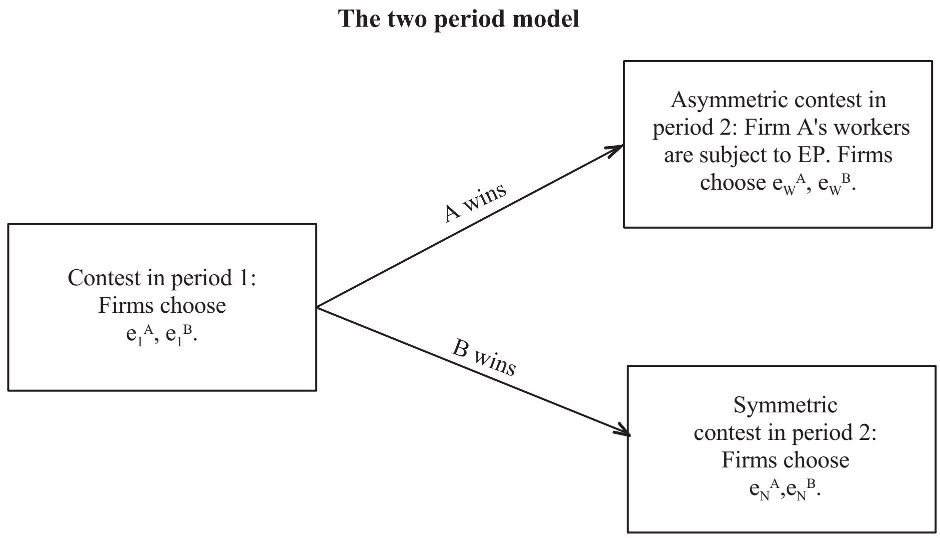

Figure 3.1: *If firm A wins the first contest, its workers are subject to EP in the second period and the contest will be asymmetric.*

In period two, two different subgames can arise, depending on which firm succeeds in period one. The situation is illustrated in figure 3.1. After firm A's success in the first period, the contest outcome will be affected by the labor market regulations just introduced. In the subgame following firm B's victory in the first round neither firm has workers with a valid contract, since firm B hires on a period by period basis with no additional costs other than the wages. Therefore, this basically replicates the situation in period one, in which no firm has hired workers. However, since the second period is the last period of the finite horizon analysis, I assume that in this subgame it is possible for both firms to hire workers for one period only. This assumption will be dropped below in the infinite horizon version.

As usual the game is solved backwards starting from period two. Consider first the subgame resulting from firm A's success in the first period. Denoting the variables corresponding to this situation with subscript W, firm A's expected payoff V_W^A is given as

$$\begin{aligned} V_W^A &= \pi_W^A(e_W^A, e_W^B)S - \left(1 - \pi_W^A(e_W^A, e_W^B)\right)\gamma S - e_W^A \\ &= \pi_W^A(e_W^A, e_W^B)\,(1+\gamma)\,S - e_W^A - \gamma S, \end{aligned} \tag{3.2}$$

The first line of (3.2) gives the expected payoff as the probability of winning, π_W^A, times the prize, S, minus the probability of losing, $1-\pi_W^A$, times the wage payments, which are still due, γS, minus contest efforts, e_W^A. The second line of (3.2) rewrites this expected payoff in the form of a contest payoff. This illustrates that firm A's payoff amounts to a sure costs of γS plus a contest for a prize of size Z_W^A, $Z_W^A = (1+\gamma)\,S$. The labor market restrictions have two effects on firm A. They imply higher fixed costs, since the wage bill has to be paid in any case. At the same time, they increase firm A's prize, and this will affect the contest outcome. Firm B's expected payoff in this subgame is given as

$$V_W^B = \left(1 - \pi_W^A(e_W^A, e_W^B)\right) S - e_W^B, \tag{3.3}$$

with $1 - \pi_W^A(e_W^A, e_W^B) = \pi_W^B$ and where the subscript W refers to the fact that firm A has hired workers. For firm B the expected payoff is just a standard contest payoff. It equals its valuation of the prize, $Z_W^B = S$, times the probability of winning minus its efforts.

The outcome of contests with a contest success function (3.1) and two players with potentially different valuations has been extensively analyzed, see Hirshleifer and Riley (1992) and Baye et al. (1996). While there is no equilibrium in pure strategies, a unique equilibrium in mixed strategies exists. Strategies are given as the cumulative density functions $F^A(e^A)$ and $F^B(e^B)$ over the the firms' efforts. A key aspect of the solution are the players' valuations. The cumulative distribution functions in equilibrium with $0 < Z^B \leq Z^A$ are

$$F^{B^*}\left(e^B\right) = 1 - \frac{Z^B}{Z^A} + \frac{e^B}{Z^A} \text{ for } e^A \in \left[0, Z^B\right], \tag{3.4}$$

$$F^{A^*}(e^A) = \frac{e^A}{Z^B} \text{ for } e^B \in \left[0, Z^B\right], \tag{3.5}$$

with $F^{j^*}(e^j) = 0$ for $e^j < 0$, and $F^{j^*}(e^j) = 1$ for $e^j > Z^B$, $j = A, B$. The intuition of the equilibrium is as follows. The supports are explained by the fact that it is never optimal for firm B to bid above its valuation. Consequently, it is also not necessary for firm A to bid that much. Furthermore, both firms must be indifferent with respect to a marginal change in effort over the whole support of their effort distribution. Firm A's marginal cost of increasing its effort by one marginal unit is one. The marginal gain is given as the marginal increase of winning times the valuation of winning, i.e. $\frac{dF^A(e^A)}{de^A}Z^A$. Therefore in equilibrium it must be that $1 = \frac{dF^A(e^A)}{de^A}Z^A$, for all e^A in the equilibrium support of e^A, explaining the uniform distribution in (3.5). Analogously the argument can be applied to firm B.

The firms' winning probabilities and expected equilibrium efforts can directly be derived from (3.4) and (3.5). For $Z^B \leq Z^A$, they are given as

$$\pi^{A^*}\left(Z^A, Z^B\right) = 1 - \frac{Z^B}{2Z^A} \text{ and } \pi^{B^*}\left(Z^A, Z^B\right) = \frac{Z^B}{2Z^A}, \tag{3.6}$$

$$Ee^{A^*} = \frac{Z^B}{2} \text{ and } Ee^{B^*} = \frac{\left(Z^B\right)^2}{2Z^A}. \tag{3.7}$$

The equilibrium expected payoffs from the contest alone, U^j, are given as

$$U^{A^*} = Z^A - Z^B \text{ and } U^{B^*} = 0. \tag{3.8}$$

Note that an increase in the valuation of the firm with the higher valuation does not affect its own expected effort, but reduces the other firm's equilibrium efforts. Consequently, the higher valuation firm's winning probability and its expected payoff are increased.

Returning to the second period contest in situation W, this subgame can now directly be solved. Firm A has a higher valuation of winning since it has hired workers:

$$Z_W^A = (1+\gamma)\, S > S = Z_W^B.$$

Substituting into (3.6) and (3.7) gives the respective equilibrium probabilities of winning and expected efforts:

$$\pi_W^{A^*} = 1 - \frac{1}{2\,(1+\gamma)} > \frac{1}{2\,(1+\gamma)} = \pi_W^{B^*},$$

$$Ee_W^{A^*} = \frac{S}{2} \text{ and } Ee_W^{B^*} = \frac{S}{2\,(1+\gamma)}.$$

Substituting into (3.2) and (3.3) the expected payoffs in equilibrium are calculated as $V_W^{B^*} = 0$ and $V_W^{A^*} = 0$. The zero equilibrium payoff of firm B is not surprising, since it follows directly from (3.8). However, for firm A the increase in fixed costs γS is exactly compensated by the expected positive payoff from the contest. Thus, while for contest behavior and winning probabilities the difference between winning and loosing is decisive, for the expected payoff we must take into account the payoff from winning the contest, the losses from still having to pay the workers if losing and the effort spent in the contest. While firm A's higher probability of winning leads to an expected positive gain from the contest, it has to bear the cost of always having to pay its workers even when there is no work to do. Interestingly, these two effects exactly balance, so that firm A's valuation to be in the subgame with workers hired is the same as firm B's.

Consider now the subgame following firm B's first period success and denote all variables corresponding to this situation with subscript N (No workers hired). In that case, both firms' valuation from winning the contest is identically S. From (3.6) and (3.8) it is evident, that both firms have an equal probability of winning, i.e. $\pi_N^{A^*} = \pi_N^{B^*} = 1/2$, and the value of the subgame is identically zero for both firms, i.e. $V_N^{A^*} = V_N^{B^*} = 0$.

Now solving the game in the first period is straightforward. Since for both subgames the continuation values are zero for both players, their contest efforts in the first period is determined by the size of the rent only. Denoting all first period variables with subscript 1, this is $Z_1^A = Z_1^B = S$. Again, from (3.6) and (3.8) it follows directly that $\pi_1^{A^*} = \pi_1^{B^*} = \frac{1}{2}$ and $V_1^{A^*} = V_1^{B^*} = 0$.

In situations in which neither firm has hired workers the winning probabilities are equal. If firm A has workers hired, its winning probability is more than one half and increasing in the size of the costs paid to its workers. Thus, on average, the firm operating from a country with a rigid labor market wins the contests more often. The expected pay-offs of both firms are zero. For firm B this follows directly from the fact that its contest valuations are either smaller or equal to firm A's. For firm A the rigidity of its labor market represents a strategic advantage in the contest of situation W. Its higher valuation causes firm B to reduce its efforts, which in turn implies a higher probability of winning with the same effort expended as without employment protection. This creates an expected rent for firm A from the contest. However, employment protection implies higher fixed costs to firm A, which have to be paid regardless of the contest outcome. The two effects exactly balance, so that A's expected payoff in equilibrium is zero, just like firm B's.

3.3 The infinite horizon model

The fact that, in the subgame following firm B's success in the first period, it suddenly becomes possible for firm A to hire for one period may be justified as a finite time horizon simplification. However, one would like to be sure, that the results do not depend qualitatively on this assumption. Therefore, the model is now extended to an infinite horizon setting. Again there are two firms A and B operating from different countries, with only firm A facing labor market regulations. As before, firm A can only sign two period contracts, whereas firm B always hires for one period. There are infinitely many periods and in each period the firms are contesting for a contract. In any period the world may be in one of two possible states - one in which neither firm has hired workers, which will be indicated by the subscript N, and one in which firm A has hired workers with a binding contract. This latter state will be indicated by a subscript W.

Starting in a period N, if firm A loses the contest, the state will remain N, since firm B will carry out the contract and firm A has no reason to hire. If, however, firm A wins the contest in situation N, it signs two period contracts and carries out the first contract. Thus, in the next round, it will have hired workers, such that the state is now W. Then, if firm A wins the contest in situation W, it carries out the contract with its already hired labor force. If it loses, it still has to pay its workers wages of size γS, although workers will be idle. At the end of period W the contracts always expire, so that from state W the situations always returns to state N, regardless of which firm has won in the contest in situation W.

The infinite horizon model is solved for the Markov perfect equilibrium (MPE). With an infinite horizon allowing for trigger strategies in the present setting would lead to a collusive outcome between the two firms, since there are substantial rents for both parties to be gained. The exclusion of trigger strategies can, however, be defended on various grounds. First, collusion may not be possible for exogenous reasons, such as competition policy and/or procurement regulations. Furthermore, the model may be extended to a setting in which there are various firms, such that collusive behavior becomes much more difficult to sustain. Finally, it should be stressed that considering the infinite horizon is mainly a device to assess the average effects of labor market regulations without biases caused by last period effects. Similarly, it can be argued that considering the collusive outcome will only distract from the main interest of the analysis.

The problem is stationary, with the two different situations N and W to be distinguished. Thus, a strategy of a firm is a rule specifying the actions to be taken conditional on being either in situation N or W. Therefore, the MPE can be found by considering the Nash equilibria in these two situations. This can be done by making use of the equilibrium properties as specified in (3.4),(3.5),(3.6) and (3.7).

Denote the expected profits V_i^j, $j = A, B$ and $i = N, W$, and let δ, $0 < \delta \leq 1$, be the discount rate. Consider first situation W. If firm A wins it gets the rent from the contract plus the discounted continuation value from being in situation N. If it looses the contest it has to pay γS and gets the discounted continuation value of being in situation N as well. Therefore the expected profits are

$$\begin{aligned} V_W^A &= \pi_W^A \left[S + \delta V_N^A\right] + (1 - \pi_W^A \left[\delta V_N^A - \gamma S\right] - e_W^A \\ &= \pi_W^A (1+\gamma) S - e_W^A - \gamma S + \delta V_N^A. \end{aligned} \tag{3.9}$$

For firm B in situation W the expected present value payoff is

$$\begin{aligned} V_W^B &= \left(1 - \pi_W^A\right) \left[S + \delta V_N^B\right] + \pi_W^A \delta V_N^B - e_W^B \\ &= \left(1 - \pi_W^A\right) S - e_W^B + \delta V_N^B. \end{aligned} \tag{3.10}$$

It is evident from (3.9) and (3.10) that situation W is completely analogous to the second period situation W in the two period model except for the additional continuation values δV_N^A and δV_N^B for both players. These do not affect the players' valuations of winning the present period contest, $Z_W^A = (1+\gamma) S$ and $Z_W^B = S$. Thus, the equilibrium strategies in situation W are exactly the same as above and consequently the respective winning probabilities are given as $\pi_W^{A^*} = 1 - 1/(2(1+\gamma))$ and $\pi_W^{B^*} = 1/(2(1+\gamma))$. Furthermore, it also follows from the above analysis that the expected payoffs in situation W from the actual period are zero for both firms. As before, for firm B with the lower valuation, expected efforts just equal expected revenue. Firm A with the higher valuation has a positive expected payoff from the contest, but faces safe wage obligations of the same size. Thus, for both players the expected value of being in situation W reduces to the expected discounted value of being in situation N:

$$V_W^A = \delta V_N^A \text{ and } V_W^B = \delta V_N^B. \tag{3.11}$$

The contests in situation N are somewhat more involved, since contrary to situation W, the firms' prizes also depend on the continuation values in equilibrium. The expected payoffs for firms A and B in situation N are given by

$$\begin{aligned} V_N^A &= \pi_N^A \left[S + \delta V_W^A\right] + (1-\pi_N^A)\delta V_N^A - e_N^A \\ &= \pi_N^A \left[S + \delta\left(V_W^A - V_N^A\right)\right] - e_N^A + \delta V_N^A, \end{aligned} \tag{3.12}$$

$$\begin{aligned} V_N^B &= \left(1-\pi_N^A\right)\left[S + \delta V_N^B\right] + \pi_N^A \delta V_W^B - e_N^B \\ &= \left(1-\pi_N^A\right)\left[S + \delta\left(V_N^B - V_W^B\right)\right] - e_N^B + \delta V_W^B. \end{aligned} \tag{3.13}$$

Making use of (3.11) the prizes are given as

$$Z_N^A = S - \delta(1-\delta) V_N^A \text{ and } Z_N^B = S + \delta(1-\delta) V_N^B \tag{3.14}$$

The equilibrium strategies in situation N can be found by considering the optimal strategies with arbitrary V_N^A and arbitrary V_N^B. First note, however, that V_N^A or V_N^B can only be positive if the firms have an expected current positive payoff from being in state N, since it was already shown that firms have an expected payoff of zero from all future W situations. Furthermore, following (3.8), this can be true for at most one firm, the one which has the higher valuation of winning.

The expected payoffs and winning probabilities are summarized in the following proposition:

Proposition 4 *In the unique MPE* $V_N^{A^*} = V_W^{A^*} = V_N^{B^*} = V_W^{B^*} = 0$ *and* $\pi_N^{A^*} = \pi_N^{B^*} = 1/2$, $\pi_W^{A^*} = 1 - 1/2\,(1+\gamma)$ *and* $\pi_W^{B^*} = 1/2\,(1+\gamma)$.

Proof of proposition 4: The equilibrium values of π_W^A and π_W^B were already derived above. Focussing on situation N, let me first show that the given outcome is actually an equilibrium in situation N. Given that $V_N^{A^*} = V_N^{B^*} = 0$ it follows from (3.14) that $Z_N^A = Z_N^B = S$. The equilibrium strategies follow directly from (3.4) and (3.5), and the winning probabilities are given by (3.6) as $\pi_N^{A^*} = \pi_N^{B^*} = 1/2$. Furthermore, neither firm has a positive expected payoff in state N, such that $V_N^{A^*} = V_N^{B^*} = 0$, and, from (3.11), $V_W^{A^*} = V_W^{B^*} = 0$.

Let me now show that this is in fact the only equilibrium. First, assume for contradiction $V_N^A > 0$. This can only be, if and only if $Z_N^A > Z_N^B$ and $V_N^B = 0$. Thus, from (3.14) $Z_N^A = S - \delta\,(1-\delta)\,V_N^A$ and $Z_N^B = S$. Thus, $Z_N^A < Z_N^B$ and consequently $V_N^A = 0$, which contradicts the assumption.

Consider now the other possibility and assume for contradiction $V_N^B > 0$. This can only be, if and only if $Z_N^A < Z_N^B$ and $V_N^A = 0$. From (3.14) it follows that $Z_N^A = S$ and $Z_N^B = S + \delta\,(1-\delta)\,V_N^B$. Since $Z_N^B > Z_N^A$ firm B's expected contest effort amounts to $Ee_N^B = S/2$ due to (3.7). Furthermore, for $Z_N^B > Z_N^A$ it must be that the equilibrium payoff is given as

$$\begin{aligned} V_N^B &= \left(1 - \frac{S}{2\left(S + \delta\left(1-\delta\right)V_N^B\right)}\right)\left[S + \delta\left(1-\delta\right)V_N^B\right] - S/2 + \delta^2 V_N^B \\ &= \delta V_N^B \end{aligned}$$

Obviously, this can only be true if $V_N^B = 0$, contradicting $V_N^B > 0$.□

Thus, the results of the two period model are valid in the infinite horizon setting as well. In situation N both firms have an equal probability of winning, whereas in situation W firm A's probability of winning is bigger than B's. Consequently, in the long run average, firm A will win more often: the rigid country's firm has a stronger average market position.[3] At the same time, both firms expected pay-offs are zero.

Finally, consider how welfare is affected in the two countries. First note that welfare effects will typically depend on the nature of contest efforts. These may be either wasteful or actually valuable to the customers. This crucially affects the welfare implications of the effort reduction by firm B in situation W. Leaving aside this question by assuming that the contractors reside in other countries, for example, since both firms' payoffs are zero, welfare can only be otherwise affected through the wage payments if these contain a rent element accruing to the workers. In this case the following proposition holds:

Proposition 5 *If welfare effects of effort changes on both countries can be*

[3] The model amounts to a Markov chain with transition probabilities from state W to N equal to one and the transition probability from state N to W equal to one half, A's winning probability in state N. The ergodic probabilities p_W and p_N of the two states can be calculated as $p_N = \frac{1}{1+(1/2)} = 2/3$ and $p_W = \frac{(1/2)}{1+(1/2)} = 1/3$. Consequently, firm A's long run average winning probability equals $p_W \pi_W^A + p_N \pi_N^A = \frac{2}{3}\left(1 - \frac{1}{2(1+\gamma)}\right) + \frac{1}{3}\frac{1}{2} = \frac{5}{6} - \frac{2}{6(1+\gamma)} > 1/2$.

neglected and wages contain equal rent elements in the two countries, expected welfare will be unambiguously higher in the rigid country.

Proof of proposition 5: From the higher average winning probability of the rigid country it follows that its expected wage bill is higher. Consequently, the expected rent accruing to the rigid country's workers is higher and thus their welfare.□

Typically, however, the average rent element will be higher in the rigid country, since its workers experience periods - those in which its firm has lost the contest with workers still hired - in which its workers are idle but nevertheless receive wages. This additionally reinforces the positive welfare effect on the rigid country.

3.4 Extensions

So far I have assumed that the firms were equally efficient, so that, for both firms winning the contract implied a rent of equal size, i.e. $S^A = S^B = S$. If the firms differ in their relative costs, the results of the model must be modified as follows. If the firm from the rigid country is more efficient, $S^A > S^B$, the results of the model are unaffected. In this case, firm A's higher valuation of winning in situation W still translates directly into higher expected payoff from the contest with workers already hired. If instead the firm from the rigid country is less efficient, $S^B > S^A$, the outcome is quite different. In this case the increase in firm A's valuation in situation W no longer converts itself directly into an expected higher payoff of equal size. As is evident from (3.8), as long as Z^A remains smaller than Z^B, the payoff from the contest is zero. However, the wage payments are certain, so that the expected payoff from being in situation W is negative for firm A. Thus, while firm A's probability of winning is still increased compared to the no EP benchmark in situation W, the negative expected payoff directly affects the previous contest in situation N, leading to a higher probability of winning for firm B in situation N.

A second variation to be considered is a change in the contest success function. If the contest success function is not fully discriminatory, the mechanism of a higher valuation causing a higher probability of winning in state W remains valid. However, expected payoffs are typically affected, causing changes in the outcome of the contest in situation N. Consider the benchmark case of a Tullock contest success function, see Tullock (1980). The probability of winning is given as $\pi_i^A(e_i^A, e_i^B) = e_i^A / \left(e_i^A + e_i^B\right)$ and $\pi_i^B(e_i^A, e_i^B) = 1 - \pi_i^A(e_i^A, e_i^B)$. Contrary to the fully discriminating contest this contest success functions produces more "noise" in the determination of the contest winner. Furthermore, the contests will allow for equilibria in pure strategies and both firms typically earn a positive expected payoff. In this case the infinite horizon model is no longer tractable, but qualitative insights can be gained from the two period set-up. Again in situation W in the second period, firm A's probability of winning is bigger than one half, due to the higher prize of firm A. However, the expected increase in the winning probability and the sure cost of the wage payments do not offset one another as in the fully discriminatory case. Instead, firm A's payoff is always reduced. This reduces firm A's valuation of winning in the first period. Consequently, in the first period firm B's probability of winning exceeds firm A's.[4] To assess the average effect on the long run average probability of winning, these two

[4] If contests are of the Tullock type, firm A's equilibrium probability of winning in the second period in situation W is given as $\pi_W^{A^*} = (1+\gamma)/(2+\gamma) > 1/2$. If $\delta = 1$, firm B's probability of winning in period one equals $\pi_1^{B^*} = \frac{16+20\gamma+5\gamma^2}{32+28\gamma+4\gamma^2}$. Therefore $\pi_W^{A^*} > \pi_1^{B^*}$, if $\gamma < 1+\sqrt{5}$

must be weighed against each other. While firm A's probability of winning in situation W is bigger than firm B's in the first period as long as γ is not to large, no clear statement can be made about the long-run average probability.[5] Thus, if the contest success function exhibits more noise, the effect of EP on the average winning probability is less clear cut. Moreover, expected payoffs for the firm from the rigid country will be lower.

Finally, instead of two period contracts, EP can be modelled so that firing costs arise automatically if the firm in the rigid country has to fire workers in any period. The resulting defensive effects are in principal the same as above. The incentive to delay the paying of firing costs will also increase the firm's winning probability in these states. However, if these costs are such that they can never be completely avoided, they imply a negative burden which will reduce firm A's probability of winning when no workers are hired and consequently also reduce the average winning probability. Thus, if the form of EP not only represents a restriction on the firm's flexibility but also definitely increases its costs, the average winning probability of the firm from the rigid country will be reduced.

3.5 Conclusion

EP has important implications for product market competition if firms interact strategically in imperfectly competitive markets. Firms subject to EP regulations will fiercely defend already gained market positions. Ex ante, however, they are more reluctant to expand their position, since this necessi-

[5] In the two period case, just adding up the probabilities of being in the various contest situations times the respective winning probabilities is not valid, since, by construction, the situation is biased towards situation N and thereby towards a higher average probability for firm B.

tates taking on workers who will be protected later on. The chapter studied the benchmark case, in which two firms compete with each other in contests for contracts. The differential effects of EP were analyzed in a situation in which one firm operates from a "rigid" country and therefore faces EP regulations, whereas the other operates from a "flexible" country without labor market restrictions.

Both for a finite and an infinite horizon setting, it was shown that the rigid country's firm wins the contests more often and that it therefore has a stronger long run market position. With protected workers, the rigid firm is a tougher competitor, since its stakes are higher. This defensive behavior creates an expected rent which just offsets the fixed wage bill. Since payoffs remain unchanged at zero for both firms, the contests in the ex ante situation without hired workers are not affected. Therefore, in these contests the firms have equal probabilities of winning. The defensive effect thus dominates and this creates the stronger average market position. If welfare effects on contractors are neglected and wages contain a rent element, welfare is higher in the rigid country.

The findings cast doubt on the common notion that blames employment protection and labor market rigidity for hurting firms' competitiveness. In situations with strategic interaction such rigidities may actually help firms to sustain a strong market position.